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EXAMINER	
ADAMS, CHARLES D	

ART UNIT	PAPER NUMBER
2164	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/815,056	LEE, EVAN C.	
	Examiner	Art Unit	
	CHARLES D. ADAMS	2164	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 January 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8 March 2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Remarks

1. In response to communications filed on 25 January 2008, claims 1, 13-14, and 19 are amended. Claims 1-20 are pending in the application.

Specification

2. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required:

Claims 19 and 20 are directed towards a storage medium, yet the phrase "storage medium" is not clearly defined in the specification.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 14-18 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

As to claims 14-18, the claims are directed towards "a fragmented database". This is a data structure. Data structures not claimed as embodied in computer-readable media are descriptive material per se and are not statutory because they are not capable of causing functional change in the computer. See, e.g., Warmerdam, 33 F.3d

at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory). Such claimed data structures do not define any structural and functional interrelationships between the data structure and other claimed aspects of the invention which permit the data structure's functionality to be realized. In contrast, a claimed computer-readable medium encoded with a data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-2, 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zait et al. (US Patent 6,665,684) in view Sinclair (US Patent 6,845,375).

As to claim 1, Zait et al. teaches a method comprising:

fragmenting a database into a plurality of database fragments using at least one fragmentation expression, the at least one fragmentation expression specifying a content of one of the plurality of database fragments (see Zait et al. 1:38-67), the fragmentation expression including:

a Boolean combination of one or more comparison-predicates, wherein each comparison-predicate:

Zait et al. does not explicitly teach:

defines a range of a fragmentation dimension basis function of one or more database fields;

Sinclair teaches:

defines a range of a fragmentation dimension basis function of one or more database fields (see 3:53-3:67 and 4:33-37); and

Zait et al. as modified teaches:

Processing a database query against the database fragments of the database based on the boolean combination of said one or more comparison-predicates (see 1:34-37 and 1:38-67. The partitions (database fragments based on the Boolean combination of one comparison predicate) can be queried); and

Providing results of the processing to a user of the database (see 1:34-38 and 2:1-9).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Zait et al. by the teachings of Sinclair, because Sinclair teaches "in some situations, particular portions of the data in a table are searched more often than other portions. If the data is properly organized, performance can be improved by searching a part of the data for queries that can take advantage of that organization" (see 1:28-32).

As to claim 2, Zait et al. as modified teaches:

Resolving a data selection expression of the database query into a Boolean combination of fragment selection comparison-predicates wherein each fragment selection comparison-predicate defines a range of one of the fragmentation dimension basis functions (see Zait et al. 2:17-40. The two comparison elements (94-04-01) and (94-06-15) are Boolean combinations in that only elements that occur within those key values are selected. They are used to define what partition ranges should be queried. In this case, it is determined to query "sal94Q2");

Identifying one or more eliminated database fragments based on the Boolean combination of fragment selection comparison-predicates and a fragmentation scheme (see Zait et al. 2:17-33); and

Processing the database query against database fragments other than the eliminated database fragments (see Zait et al. 2:17-33).

As to claim 14, Zait et al. teaches:

A fragmentation scheme (see 1:45-67) including:

Zait et al. does not explicitly teach:

(i) one or more fragmentation dimension basis functions wherein each fragmentation dimension basis function depends upon one or more database fields, and

Sinclair teaches:

(i) one or more fragmentation dimension basis functions wherein each fragmentation dimension basis function depends upon one or more database fields (see 3:53-3:67 and 4:33-37), and

Zait et al. as modified teaches:

(ii) a plurality of fragmentation expressions, each fragmentation expression being defined by a Boolean combination of comparison-predicates wherein each comparison-predicate defines a range of one of the fragmentation dimension basis functions (see Zait et al. 1:45-67); and

a plurality of database fragments, each database fragment containing data satisfying a corresponding one of the plurality of fragmentation expressions, thereby enabling improved query efficiency by utilization of fragment elimination based on the fragmentation scheme during query processing which produces query results for a user of the database (see Zait et al. 1:31-37 and 1:45-67).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Zait et al. by the teachings of Sinclair, because Sinclair teaches "in some situations, particular portions of the data in a table are searched more often than other portions. If the data is properly organized, performance can be improved by searching a part of the data for queries that can take advantage of that organization" (see 1:28-32).

As to claim 15, Zait et al. as modified teaches:

A query processor performing a method including (i) receiving a database query and (ii) processing the database query against the plurality of database fragments (see 2:17-40); and

A fragment elimination processor performing a method including:

(i) resolving a data selection expression of the database query into a Boolean combination of fragment selection comparison-predicates wherein each fragment selection comparison-predicate defines a range of one of the fragmentation basis functions (see Zait et al. 2:17-40. The two comparison elements (94-04-01) and (94-06-15) are Boolean combinations in that only elements that occur within those key values are selected. They are used to define what partition ranges should be queried. In this case, it is determined to query "sal94Q2"), and

(ii) eliminating one or more of the plurality of database fragments from the processing of the database query by the query processor, the eliminating being based on comparison of the boolean combination of fragment selection comparison-predicates with the fragmentation expressions (see Zait et al. 2:17-40).

As to claim 16, Zait et al. teaches wherein the one or more fragmentation dimension basis functions comprise:

A first fragmentation dimension basis function depending upon at least a first database field (see 1:45-67); and

A second fragmentation dimension basis function depending upon at least the first database field (see 1:45-67).

As to claim 17, Zait et al. as modified teaches wherein the one or more fragmentation dimension basis functions comprise:

a fragmentation dimension database function that depends upon at least two database fields (see Sinclair 3:53-3:67).

As to claim 18, Zait et al. as modified teaches wherein the one or more fragmentation dimension basis functions comprise:

A fragmentation dimension basis function that includes an extraction operator (see 1:45-67. Rows are extracted from the data and split into the different partitions).

7. Claims 3-6, 8-9, and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zait et al. (US Patent 6,665,684) in view of Sinclair (US Patent 6,845,375), and further in view of Jakobsson et al. (US Patent 6,965,891).

As to claim 3, Zait et al. as modified teaches wherein the resolving of the data selection into a Boolean combination of fragment selection comparison-predicates comprises:

Identifying a comparison-predicate of the data selection expression, the comparison-predicate including a comparison operator comparing a constant value with

a candidate function that depends upon one or more database fields (see Zait et al. 2:17-40 and Sinclair 3:53-3:67 and 4:33-37); and

Zait et al. does not teach converting the identified comparison-predicate into one or more of the fragment selection comparison-predicates.

Jakobsson et al. teaches converting the identified comparison-predicate into one or more of the fragment selection comparison-predicates (see 8:31-64).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Zait et al. in view of Jakobsson et al., since Jakobsson et al. teaches that "smaller objects are often easier to manage and more efficient to search than larger objects. Thus, database systems utilize partitioning to decompose objects such as tables and indexes into smaller and more manageable pieces or "partitions"" (see 1:10-14).

As to claim 4, Zait et al. as modified teaches wherein the converting comprises:

identifying the selected candidate function as equivalent to one of the fragmentation dimension basis functions (see Jakobsson et al. 8:31-64).

As to claim 5, Zait et al. as modified teaches wherein the converting comprises: applying a monotonic transform to the candidate function and to the constant value of a identified comparison-predicate, the application of the monotonic transform converting the candidate function into one of the fragmentation dimension basis functions (see Jakobsson et al. 8:31-64. Monotonic transformations preserve the order of a function. In

this case, the converted function still has the same order, as it is still simply querying the memory partition).

As to claim 6, Zait et al. as modified teaches wherein the applying of a monotonic transform comprises:

Applying an extraction function to the candidate function and to the constant value of the identified comparison-predicate (see Jakobsson et al. 8:31-64. The candidate function product.product_category='MEMORY' is extracted from the original query, as it is reused in the converted query).

As to claim 8, Zait et al. as modified teaches wherein the candidate function of the identified comparison-predicate is an extraction of one of the fragmentation dimension basis functions (see Jakobsson et al. 8:31-64), and the applying of a monotonic transform comprises:

Substituting the fragmentation dimension basis function for the candidate function of the identified comparison-predicate (see Zait et al 2:17-40 and Jakobsson et al. 8:31-64);

Substituting a new value for the constant value of the identified comparison-predicate, the extraction applied to the new value producing the constant value (see Zait et al 2:17-40 and Jakobsson et al. 8:31-64).

As to claim 9, Zeit et al. as modified teaches wherein the applying of a monotonic transform includes:

Applying a monotonic transform that changes granularity (see Jakobsson et al. 11:14-12:23); and

Selecting an endpoint of a range of the transformed identified comparison-predicate to ensure that the range of the transformed identified comparison-predicate includes the entire range of the identified comparison-predicate (see Zait et al. 2:17-34. The comparison predicate is compared to the fragments to determine what fragment to query against. The fragments have endpoints, so choosing a fragment selects an endpoint).

As to claim 11, Zait et al. as modified teaches wherein the converting of the identified comparison-predicate into one or more of the fragment selection comparison-predicates includes:

converting the identified comparison-predicate into a fragment selection comparison-predicate having a range that (i) is larger than the range of the identified comparison-predicate and (ii) includes the range of the identified comparison-predicate (see Zait et al. 2:17-34. The comparison is converted to querying the entire partition, which is larger than the current query, and includes the range of the current query).

As to claim 12, Zait et al. as modified teaches wherein the converting of the identified comparison-predicate into one or more of the fragment selection comparison-predicates includes:

Converting the identified comparison-predicate into a fragment selection comparison-predicate having a smaller granularity than the identified comparison-predicate, an endpoint of the range defined by the fragment selection comparison-predicate being selected to include the entire range of the identified comparison-predicate (see Jakobsson et al. 8:31-64 and Zait et al. 2:17-34).

8. Claims 7 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zait et al. (US Patent 6,665,684) in view of Sinclair (US Patent 6,845,375), in view of Jakobsson et al. (US Patent 6,9065,891), and further in view of Antoshenkov (US Patent 5,664,172).

As to claim 7, Zait et al. as modified teaches wherein applying the extraction function increases granularity (see Jakobsson et al. 11:14-12:23)

Zait et al. does not teach wherein the comparison operator of the identified comparison-predicate is an exclusive comparison operator

Antoshenkov teaches wherein the comparison operator of the identified comparison-predicate is an exclusive comparison operator (see Antoshenkov 8:41-64), and the converting further comprises:

Replacing the exclusive comparison operator with an inclusive comparison operator (see Antoshenkov 8:41-64).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified Zait et al. by the teaching of Antoshenkov, since Antoshenkov teaches that "the invention determines the near-largest interval for which the selection criteria is always false and avoids scanning the corresponding portion of the database. Also, within any interval of values for which the selection criteria is always true, evaluation of the records is not necessary, since the records satisfy the selection criteria" (2:66-3:5).

As to claim 10, Zait et al. as modified teaches the method as set forth in claim 5.

Zait et al. as modified does not teach applying a monotonically decreasing transform to the candidate function and to the constant value of the identified comparison predicate;

Antoshenkov teaches applying a monotonically decreasing transform to the candidate function and to the constant value of the identified comparison predicate (see Antoshenkov 8:41-64); and

Zait et al. as modified teaches reversing a directionality of the comparison operator of the identified comparison-predicate (see Antoshenkov 8:41-64).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified Zait et al. by the teaching of Antoshenkov, since Antoshenkov teaches that "the invention determines the near-

largest interval for which the selection criteria is always false and avoids scanning the corresponding portion of the database. Also, within any interval of values for which the selection criteria is always true, evaluation of the records is not necessary, since the records satisfy the selection criteria" (2:66-3:5).

9. Claims 13 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zait et al. (US Patent 6,665,684) in view of Sinclair (US Patent 6,845,375), and further in view of Hallmark et al. (US Patent 6,014,656).

As to claim 13, Zait et al. as modified teaches the method of claim 1.

Zait et al. does not teach recognizing the query as a row insert or row update operation including a plurality of new record fields corresponding to database fields of the database;

Hallmark et al. teaches recognizing the query as a row insert or row update operation including a plurality of new record fields corresponding to database fields of the database (see 12:33-42);

Zait et al. as modified teaches computing fragmentation dimension values corresponding to the fragmentation dimension basis functions using the new record fields as inputs (see 12:33-42); and

Inserting or updating using the new record fields in an identified one of the database fragments whose corresponding fragmentation expression is satisfied by the computer fragmentation dimension values (see 12:33-42).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Zait et al. in view of Hallmark et al., since Hallmark et al. teaches that "dividing a table into partitions allows query execution time to be reduced by removing from consideration those partitions that cannot possibly contain rows that satisfy specified query conditions" (see Hallmark et al. 4:55-58).

As to claim 19, Zait et al. teaches:

Program code for constructing a fragmented database (see 1:44-67)

Zait et al. does not explicitly teach:

having a fragmentation scheme constructed based on computed values of fragmentation dimension basis functions, each fragmentation dimension basis configured to compute the values based upon at least one database field,

Sinclair teaches:

having a fragmentation scheme constructed based on computed values of fragmentation dimension basis functions, each fragmentation dimension basis configured to compute the values based upon at least one database field (see 3:53-3:67 and 4:33-37);

Zait et al. as modified teaches:

the fragmentation scheme being defined by a Boolean combination of comparison-predicates, in which each comparison predicate defines a range of selected ones of said fragmentation dimension basis function (see Zait et al. 1:45-67) ; and

Zait et al. does not teach program code for inserting a new record into the fragmented database, the inserting including (i) computing values of the fragmentation dimension the at least one database field of the new record, (ii) selecting a target database fragment based on the fragmentation scheme and the computer values of the fragmentation dimension basis functions, and (iii) inserting the new record into the target database fragment.

Hallmark et al. teaches program code for inserting a new record into the fragmented database, the inserting including (i) computing values of the fragmentation dimension basis functions using the at least one database field of the new record, (ii) selecting a target database fragment based on the fragmentation scheme and the computer values of the fragmentation dimension basis functions, and (iii) inserting the new record into the target database fragment (see 12:33-42. Hallmark et al. computes the values of the possible qualifying partitions based on the field of the new record, and allows a user to select among qualifying partitions).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Zait et al. in view of Hallmark et al., since Hallmark et al. teaches that "dividing a table into partitions allows query execution time to be reduced by removing from consideration those partitions that cannot possibly contain rows that satisfy specified query conditions" (see Hallmark et al. 4:55-58).

As to claim 20, Zait et al. as modified teaches:

Program code for performing a database query, the performing including

(i) resolving a data selection expression of the database query into one or more one-dimensional expressions each dimensioned by one of the fragmentation dimension basis functions (see Hallmark et al. 9:63-10:61),

(ii) identifying at least one eliminated database fragment based on the one or more one-dimensional expressions and the fragmentation scheme (see Hallmark et al. 10:58-10:61), and

(iii) processing the database query against the database fragments other than the at least one eliminated database fragment (see Hallmark et al. 10:58-10:61).

Response to Arguments

10. Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHARLES D. ADAMS whose telephone number is (571)272-3938. The examiner can normally be reached on 8:30 AM - 5:00 PM, M - F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Rones can be reached on (571) 272-4085. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/C. D. A./
Examiner, Art Unit 2164

/Charles Rones/
Supervisory Patent Examiner, Art Unit 2164